NTHMP Modeling and Mapping Subcommittee Meeting Minutes

Date, Time: 2 November 2004, 1-5 pm
Location: California State Office Building, Room 12
1300 Clay Street
Oakland, California
Attendees: Eddie Bernard, George Crawford, Richard Eisner, Eric Geist, Frank González, Roger Hansen, Don Hoirup, Chris Jonientz-Trisler, Juan Pestana, George Priest, Michael Reichle, Scott Simmons, Costas Synolakis, Vasily Titov, Tim Walsh, Jay Wilson, Brian Yanagi, Sterling Yong

Prior to this first meeting of the subcommittee, González distributed an agenda and a summary of issues previously discussed by e-mail and telephone. The meeting addressed three main topics: Subcommittee Organization and Structure; Tsunami Model Certification; Source Modeling and Source Probabilities.

Subcommittee Organization and Structure. After considerable discussion, consensus was reached on several agenda issues:

1. MMS decision-making and the development of recommendations to the Steering Group will emphasize consensus. Dissenting opinions will be documented, and dissenters may choose to submit a dissenting report to the MMS and Steering Group.
2. Emergency Manager membership on the MMS is unnecessary
3. Expansion of the membership to include a USGS and NSF member is not desirable.
4. The TIME Center Director will serve as MMS chair.

Consensus was thereby reached on the following organization and structure of the MMS.

NTHMP Modeling and Mapping Subcommittee

• Statement of Purpose

"The responsibility of the NTHMP Modeling and Mapping Subcommittee is to develop scientific, technical and policy recommendations for the NTHMP Steering Group that are based on the best available science."

• Organizational Structure

- current State Geotechnical official on the Steering Group
- current TIME Center Director (Chairperson)

• Decision-making

- Consensus; dissenting reports
- Invited experts to assist, as needed

As a consequence, the current MMS members are

• Current MMS Membership

- Alaska: Roger Hansen
- California: Michael Reichle
- Hawaii: Sterling Yong
- Oregon: George Priest
- Washington: Tim Walsh
- TIME Center: Frank González (Chairperson)

The committee next addressed two modeling and mapping issues, with the help of invited experts.

Tsunami Model Certification. Invited experts Costas Synolakis (USC) and Vasily Titov (UW/JISAO/TIME Center) presented a review of tsunami hydrodynamic modeling from the point of view of establishing standards and procedures for the identification of NTHMP-approved tsunami models for use in developing NTHMP products and capabilities.

Synolakis presented a history of hydrodynamic modeling of tsunamis, with an emphasis on descriptions of the earlier benchmark tests and validation exercises. He pointed out that there have been several workshops that focused on such activities, with modelers invited to test their individual models against the same benchmark tests and actual event data, such as the 1992 Okushiri tsunami, and that publications are available that document these results. Titov provided actual examples and results of such tests for the MOST model, used by USC and the TIME Center to produce model-based NTHMP products and forecast capabilities for California, Washington, and the NOAA Tsunami Warning Centers. Titov also emphasized that standards should probably be somewhat different for the two primary NTHMP applications -- inundation maps, and real-time forecasting. This is because each application should require different priorities and tradeoffs between such factors as speed, accuracy and robustness.

Discussion and Recommendations

González presented three draft recommendations to the NTHMP Steering Group were presented for discussion and approval, in the form of a PowerPoint slide:

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Tsunami Model Certification: Strawman Recommendation(s)
(***Philosophy: Document Scientific Process; Avoid Conflicts of Interest)***

1. **That Standards and Procedures be developed for NTHMP Tsunami Model Certification**

2. **That Peer-reviewed Journal Articles form the basis for Certification Standards and Procedures**
   - *Methodology (Hydrodynamics, Numerical Scheme, etc.)*
   - *Benchmark tests (Analytic, Laboratory, Field obs, etc.)*
   - *Case Studies (Okushiri, Nicaragua, Flores, PNG, etc.)*

3. **That Guidelines on Certification Standards and Procedures be developed by the MMS, in consultation with community experts**
   - *Standards: Content of documentation; metrics …*
   - *Procedures: Database of case studies; approval …*
   - *Priority: Request documentation on existing NTHMP models*

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Discussion included all present – MMS members, invited experts, and guests – and was wide-ranging, covering scientific, technical and policy issues. Consensus was reached on a change of the word "Certification" to "Approval," primarily because of concerns regarding legal issues and liabilities that might be implied. Roger Hansen raised an objection to the phrase "Peer-reviewed Journal Articles," suggesting that this phrase be replaced by "Peer-reviewed Publications." A substantial discussion of this issue then ensued, with the result that 5 of the 6 MMS members agreed to retain the phrase "Peer-reviewed Journal Articles," with Roger Hansen dissenting. As agreed above, Hansen's dissent and his option to submit a dissenting report to the MMS and Steering Group is documented here.

González created a revised PowerPoint slide to reflect the one-word changes agreed upon, and the final version of the MMS recommendations to the NTHMP Steering Group for establishing standards and procedures for the identification of NTHMP-approved tsunami models follows.

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Tsunami Model Approval

1. That Standards and Procedures be developed for NTHMP Tsunami Model Approval

2. That Peer-reviewed Journal Articles form the basis for Approval Standards and Procedures

- Methodology (Hydrodynamics, Numerical Scheme, etc.)
- Benchmark tests (Analytic, Laboratory, Field obs, etc.)
- Case Studies (Okushiri, Nicaragua, Flores, PNG, etc.)

3. That Guidelines on Approval Standards and Procedures be developed by the MMS, in consultation with community experts.

- Standards: Content of documentation; metrics …
- Procedures: Database of case studies; approval …
- Request documentation on existing models

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In addition, the following Action Item was assigned:

Action Item. González will develop an inventory and report on the existing documentation of tsunami models currently being used to develop NTHMP products.

Source Modeling and Source Probabilities. Invited expert Eric Geist (USGS) presented two topics to the Mapping and Modeling Subcommittee: (1) dealing with complexities and uncertainties associated with tsunami sources and (2) development of probabilistic tsunami hazard analysis (PTHA) in association with the ongoing FEMA pilot study at Seaside, Oregon.

For the first topic, it was indicated that reliance on historic sources might not take into account event-to-event variations in source parameters that may occur. Using historic earthquakes as the maximum credible source, for example, implicitly assumes a characteristic earthquake rupture model. Analysis of historic seismicity indicates, however, that many faults behave non-characteristically. The challenge then is to reconcile non-characteristic behavior with specification of maximum credible sources and how to accommodate the associated uncertainty of non-characteristic sources into tsunami inundation maps.

A review of PTHA was also presented with particular reference to similar efforts in the seismic hazard mapping community. The two primary ways that PTHA differs from Probabilistic Seismic Hazard Analysis (PSHA) is that PTHA needs to include far-field sources into the analysis and that numerical propagation models can be effectively used in PTHA. The latter is a distinct technological advantage in comparison to PSHA that relies on empirical attenuation relationships (and associated uncertainty) linking the source and the site hazard. Overall, probabilistic analysis gives an additional dimension--likelihood of hazard occurring--with which emergency managers and land-use planners can make informed decisions.

Discussion. One issue discussed was the possible establishment of standards and procedures to identify NTHMP-approved seismic source models, in parallel with the tsunami model recommendations, above. Geist suggested that there is an abundance of seismic model documentation in the form of peer-reviewed journal articles. With time short, all agreed that this issue must be further investigated and resolved, as a high-priority MMS item.

APPENDIX

Pre-meeting material distributed by e-mail on 20 October 2004: Background; Agenda; Technical Issues.

Modeling and Mapping Subcommittee Meeting

2 November 2004
California Governor's Office of Emergency Services, Coastal Region
Oakland, California

Background. The following is based on e-mail discussions conducted 15 July to 7 September, 2004.

Organizational Items

Agreement was reached on the Statement of Purpose, Organizational Structure and, thus, the Current Membership:

- Statement of Purpose:
  "The responsibility of the NTHMP Modeling and Mapping Subcommittee is to develop scientific, technical and policy recommendations for the NTHMP Steering Group that are based on the best available science."

- Organizational Structure:
  - current State Emergency Management official on the Steering Group,
  - current State Geotechnical official on the Steering Group,
  - current Director of the TIME Center

- Current Membership:

Alaska:	Scott Simmons and Roger Hansen
California:	Richard Eisner and Michael Reichle
Hawaii:	Brian Yanagi and Sterling Yong
Oregon:	George Priest and Jay Wilson
Washington:	George Crawford and Tim Walsh
TIME Center:	Frank Gonzalez

Disagreements on two items are currently unresolved:

- Voting Structure
- Membership Expansion

Technical Issues. Attachment A lists technical issues identified by subcommittee members, so far. These have been loosely annotated with relevant sub-issues, and organized into two broad categories: (1) Standards and Quality Assurance and (2) Technology Improvement.

Meeting Agenda

2 November 2004
California Governor's Office of Emergency Services, Coastal Region
Oakland, California

13:00 ***Unresolved Organizational Items.*** E-mail discussion left the following questions unresolved:

Voting.

- Shall State votes be cast only by the State Emergency Management official (1 vote per State), or shall the State Geotechnical official also vote (2 votes per State) ?
- Shall the TIME Director cast a vote on all issues, or vote only to break a tie ?
- Shall the voting privilege be transferable to an Alternate ? If so, may an Alternate cast more than one vote ?

Membership Expansion. E-mail discussions produced the following proposals:

PROPOSAL 1. Add a USGS Steering Group representative.
PROPOSAL 2. Add an NSF Steering Group representative.

Chairperson. Not discussed, but should be resolved.

- Current TIME Director serves as chairperson ?
- Rotate chair among current State officials ?
- Other … ?

13:30 ***Technical Issue:*** Tsunami Model Certification

Invited expert: Costas Synolakis, USC

The goal of this discussion will be to develop, if possible, a recommendation to the Steering Group regarding the establishment of NTHMP Tsunami Model Certification procedures.

15:00 ***Technical Issue:*** Source Modeling and Source Probabilities

Invited expert: Eric Geist, USGS

The goal of this discussion will be to develop, if possible, a recommendation to the Steering Group regarding source modeling.

16:30 ***Summary and wrap-up***

17:00 ***Adjourn***

Attachment A. Technical Issues.

Category 1. ***Standards and Quality Assurance***

- Model Certification (Tsunami and Source)
  - *Benchmark tests (Analytic, Field data, Lab data, …)*
  - *Documentation*
  - *Peer Review*
- Grid Quality Assessment
  - *Bathy/topo data quality and density*
  - *Datum and other errors*
  - *Adequate resolution*
- Minimum Source Probability
  - *X % Probability of Occurrence in Y year*
- Content of Map and Accompanying Text
  - *Source Discussion*
  - *Modeling Discussion*
  - *Uncertainties (Using, e.g., multiple source runs, degraded grids, other methodologies ?)*
  - *General Advice on Use*
  - *Graphic & Digital Products – Max depth, ETA, time histories, etc.*
- Map Quality Rating System
  - *Grid Quality*
  - *Source Knowledge*
  - *Other …*
- Map Review Process
  - *TIME Center*
  - *Outside review panel*
  - *Both*
- Publication Standards
  - *Format*
  - *Responsible State Agency*

Category 2. ***Technology Improvements***

- Bathy/Topo Data Acquisition
- Source Models
  - *Geophysical sources*
  - *Design sources*
- Probabilistic Methodologies
- Evacuation Models